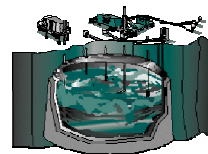




## Liquid Membrane System for Removal and Concentration of Transuranic Elements



**Developer:** LSR Technologies, Inc.  
**Contract Number:** DE-AR21-96MC33080  
**Crosscutting Area:** ESP

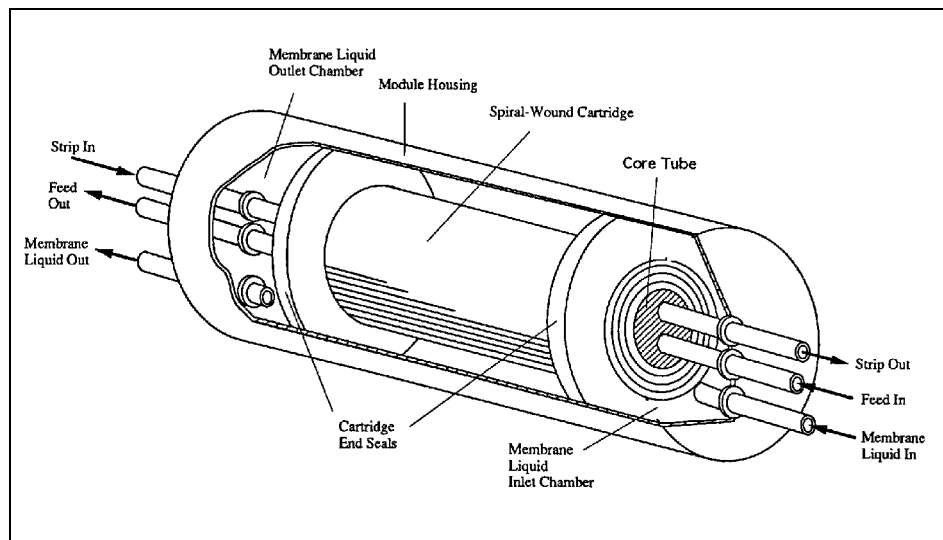
**Tanks  
FOCUS AREA**

### Problem:

The treatment and disposal of radioactive waste generated in past plutonium operations represents an immense technical and economic challenge. In the case of the Hanford tank sludge wastes, a baseline approach has been defined in which the sludges will be leached with a high caustic solution to dissolve certain nonradioactive components. The leached sludge, which contains transuranics (TRUs), Strontium-90 ( $^{90}\text{Sr}$ ), etc. will then be vitrified for geologic disposal. The cost of this baseline scheme has been estimated to be \$3 billion. Furthermore, there may not be enough space available in a deep geological repository.

### Solution:

There are technical and economic incentives to apply advanced processes to separate the radioactive and nonradioactive components of Hanford tank waste and drastically reduce the volume of high-level waste. The transuranic extraction (TRUEX) process and the strontium extraction (SREX) process have been proposed to accomplish this goal. Reliable, efficient, and compact systems are required to



successfully implement the TRUEX and SREX processes. A new Moving Liquid Membrane System (MLMS) will be employed for selective removal and concentration of TRUs and  $^{90}\text{Sr}$  from dissolved tank waste, thereby minimizing the volume of high-level waste (HLW).

### Benefits:

- High TRUs and  $^{90}\text{Sr}$  removal selectivity and concentration factor
- Significant reduction of HLW volume
- Compact modular system with flexible operating conditions and automated controls for reduced worker exposure to radioactive environment

- Stable performance with reduced chemical and extractant consumption

### Technology:

The overall goal of this project is to develop and demonstrate the MLMS for selective removal and concentration of transuranic elements and  $^{90}\text{Sr}$  from radioactive waste streams. The unique MLMS has been demonstrated in two different applications and in a non-radioactive environment: (1) heavy metals removal and concentration from industrial wastewater, (2) selective  $\text{H}_2\text{S}$  removal from  $\text{H}_2\text{S}/\text{CO}_2$ -containing gaseous streams. Both plate-and-frame and spiral-wound MLMS modules have been developed and demonstrated.



The advantages of the MLMS include: (1) combination of non-dispersive extraction and stripping steps in one single unit with simplified control and operation; (2) reduced maintenance; (3) elimination of equilibrium limitations encountered in a conventional two-step process and reduction of chemical inventory and consumption; (4) elimination of instability of conventional supported liquid membrane system due to liquid membrane configuration; and (5) compact, modular system with high selectivity and concentration power.

The technical challenges for using MLMS in the TRUEX and SREX processes are the development of radiation-resistant membrane modules and their evaluation using actual dissolved Hanford tank waste. The extractants for TRUs and <sup>90</sup>Sr are commercially available. The MLMS will initially be developed and optimized with cold, simulant feed solutions, and then subjected to evaluation with an actual waste stream.

### Contacts:

LSR Technologies, Inc. is a small research and development firm based in Acton, MA. LSR has been an active participant in various development and demonstration programs in the field of pollution

control and prevention, sponsored by the Department of Energy (DOE) and the Environmental Protection Agency (EPA). For information on this project, the contractor contact is:

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